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"Development of a flexible, innovative and practical framework for Work-based Learning in higher education of Armenia and Russia" (FlexWBL)

**Methodological Guideline
For the analysis of acted curricula**

(drafted by the NUACA within the FlexWBL Erasmus+ project)

5 February, 2021

This guideline is intended for the analysis of acted curricula of study program within the FlexWBL Erasmus+ project. Based on the findings resulting by the analysis, the possibilities for creation of integrated curricula of WBL will be identified. The analysis of the acted curriculum will be based on the system of indicators that characterize the acted study program (Table 1).

Table 1. Indicators of analysis of acted Curriculum

##	Indicators	Definition	PSU
1	The code of the study program	Each study program has a specific code. <i>For example the code of the study program on "Project management" is 041301.13.7</i>	28.04.01
2	The title of the study program	<i>For example: "Project management"</i>	Nanotechnologies and microsystems technologies
3	Qualification	Indicate which qualification will be awarded to students after study program graduate (Bachelor, Master degree, PhD).	Master
4	Students	Indicate how many students are studied on the selected study program, how many of them are working simultaneously with	10 students 1 st year —5 students 2 nd year —5 students

		study, which part is working at the workplace that is very closed to the study program profile.	
4	Curriculum development process	Indicate who specifically is engaged in the process of curriculum development and who is responsible (department title, person's position who is engaged).	Head of a department, deputy dean for academic affairs, dean
5	Curriculum approval process	Indicate who is responsible for curriculum approval, what actions have to be done.	Head of the department for academic process provision develops the main part of the study programme that covers disciplines, internships, final attestation and assessment systems
6	The goal of the study program and learning outcomes	Indicate what is the main goal of the study program and which knowledge and skills students will get after graduate successfully.	The goal is to prepare specialists who understand physical and chemical processes at atomic and molecular level. The specialists should be able to conduct experiments and theoretic research into physics of condensed matter, solve applied scientific and technical tasks in photonics
7	Knowledge and skills assessment	Describe how the students' knowledge and skills are assessed during the study process and by the end (exam, project presentation, essay, graduate thesis, etc).	State examination, defence of graduate qualification work (Master thesis)
8	Graduants employability	Specify the field of the industry (enterprise, company of state or private sectors) where the graduants of the study program could be employed.	The major partner is Perm Scientific-Industrial Instrument Making Company (PNPPK PJSC) that employs PSU graduates
9	Duration of study program	Indicate how many years (months, semesters) the study program takes.	2 years

10	Workload of the study program	Specify the ETCS (credits), the total number of academic hours, how many hours (credits) are assigned for theoretical and practical classwork (laboratory activity, project development, etc.), the total hours assigned for individual work of students outside of the university.	Total workload of the program is 120 credits – over 60% is devoted to independent study, internships take 30 credits
11	The industrial internship	Indicate what is the total duration of the industrial internship, when it is conducted, whether the student earns ETCS (credits) through the internship, other details.	Not applicable to this program
12	Curriculum Structure	Specify the mandatory and selective subjects of the Curriculum, create the table with all subjects included in the curriculum with indicating their credits (ETCS), hours, calculate the ratio of subjects related to the profession directly and interdisciplinary subjects, as well as specify the percentage of hours intended for practical work of students, etc.	<p><i>Compulsory disciplines</i></p> <p>Academic and professional communication in the English language – 4 credits</p> <p>Relevant issues of modern nanotechnologies – 3 credits</p> <p>History and methodology of science and technology in the field of nanotechnologies – 3 credits</p> <p>Academic and professional communication – 3 credits</p> <p>Computer technologies in research – 6 credits</p> <p>Methods of mathematical modelling – 4 credits</p> <p>Micro- and nanosystems in technics and technologies – 4 credits</p> <p>Principles of organisation of high-tech production – 3 credits</p> <p><i>Variable part of the curriculum</i></p> <p>Automatic systems of construction of micro- and nanosystems elements – 4 credits</p>

			<p>Infrared spectroscopy and combinatorial scattering spectroscopy – 3 credits</p> <p>Quantum and semiconductor electronics – 4 credits</p> <p>Cultural diversity and dialogue of cultures – 3 credits</p> <p>Matrix optics – 4 credits</p> <p>Methods of photonic integrated circuits modelling – 4 credits</p> <p>Plasma and chemical technologies of production of micro- and nanosystems elements – 4 credits</p> <p>Materials performance under extreme physical conditions – 3 credits</p> <p>Project management – 3 credits</p> <p>Professional and personal self-development – 3 credits</p> <p>Systematic problem solving – 3 credits</p> <p>Theory of abnormal diffusion – 3 credits</p> <p>Elements of photonic integrated circuits – 4 credits</p> <p><i>Elective disciplines (modules)</i></p> <p>Fundamentals of negotiating process – 3 credits</p> <p>Oral communication in a foreign language in academic and professional activity – 3 credits</p> <p>Written communication in a foreign language in academic and professional activity – 3 credits</p> <p>Conflict management in professional activity – 3 credits</p> <p><i>Internships</i></p> <p>Research internship – 24 credits</p> <p>Research internship (fundamentals of research work) – 3 credits</p> <p>Pre-degree internship – 3 credits</p>
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			<i>Final state attestation</i> – 9 credits State examination – 3 credits Graduate qualification work (Master thesis) – 6 credits Elective discipline – 3 credits
13	Syllabus development	Briefly describe how the syllabus is developed for the subject that is related directly to the profession, whether is planned some hours for the work of students in some workplace outside of the university. Briefly describe how the subjects are linked with the outcomes of the study program.	The curriculum contains general disciplines such as history, philosophy; general professional disciplines (mechanics, optics) and professional disciplines (physical and chemical basics of micro- and nanotechnological processes)
14	Policy within the study program	Indicate the norms of students' and teachers behavior within the study program, particularly whether the students presence at the university is mandatory, which methods are used for teaching (lectures, interactive discussions, presentations, other technics), etc.	Part of the classes is conducted at PNPPK and as laboratory workshops
15	Students weekly workload	Specify how many hours per week students are busy at the university, how many of them are theoretical and practical classwork.	It depends on a course, for example it might be 14 hours of lectures per term and 14 hours of internship per week

##	Indicators	Definition	PSU
1	The code of the study program	Each study program has a specific code. <i>For</i>	05.04.04

		<i>example the code of the study program on “Project management” is 041301.13.7</i>	
2	The title of the study program	<i>For example: “Project management”</i>	Hydrometeorology (major – Meteorology)
3	Qualification	Indicate which qualification will be awarded to students after study program graduate (Bachelor, Master degree, PhD).	Master
4	Students	Indicate how many students are studied on the selected study program, how many of them are working simultaneously with study, which part is working at the workplace that is very closed to the study program profile.	16 current students 16 students combine work and study (7 directly connected to the major)
4	Curriculum development process	Indicate who specifically is engaged in the process of curriculum development and who is responsible (department title, person’s position who is engaged).	Department of meteorology and protection of the atmosphere and its head – Nikolay Kalinin; executive in charge is Andrey Vetrov, lecturer of the department of meteorology and protection of the atmosphere
5	Curriculum approval process	Indicate who is responsible for curriculum approval, what actions have to be done.	Head of the department for academic process provision develops the main part of the study programme that covers disciplines, internships, final attestation and assessment systems
6	The goal of the study program and learning outcomes	Indicate what is the main goal of the study program and which knowledge and skills students will get after graduate successfully.	The goal is to prepare a specialist who is able to perform professional activity and conduct research in the field of meteorology, climatology, ecology, weather forecast development and protection of the atmosphere
7	Knowledge and skills	Describe how the	Examinations, essays, tests, oral

	assessment	students' knowledge and skills are assessed during the study process and by the end (exam, project presentation, essay, graduate thesis, etc).	presentations, reports, defence of graduate qualification work (Master thesis)
8	Graduants employability	Specify the field of the industry (enterprise, company of state or private sectors) where the graduants of the study program could be employed.	Public service: Roshydromet Air transport: Aviamettelecom of Roshydromet
9	Duration of study program	Indicate how many years (months, semesters) the study program takes.	2 years
10	Workload of the study program	Specify the ETCS (credits), the total number of academic hours, how many hours (credits) are assigned for theoretical and practical classwork (laboratory activity, project development, etc.), the total hours assigned for individual work of students outside of the university.	120 credits; 4320 academic hours: 684 hours of theoretical and practical study and 3636 hours of independent study
11	The industrial internship	Indicate what is the total duration of the industrial internship, when it is conducted, whether the student earns ETCS (credits) through the internship, other details.	1080 hours (30 credits), internships are undertaken in the 3 th and 5 th terms
12	Curriculum Structure	Specify the mandatory and selective subjects of the Curriculum, create the table with all subjects included in the curriculum with indicating their credits	<i>Compulsory disciplines</i> Academic and business writing – 3 credits History, theory and methodology of hydrometeorology - 3 credits Cultural diversity and dialogue of cultures - 3 credits

		<p>(ETCS), hours, calculate the ratio of subjects related to the profession directly and interdisciplinary subjects, as well as specify the percentage of hours intended for practical work of students, etc.</p>	<p>Project management - 3 credits Professional and personal self-development - 3 credits Systematic problem solving - 3 credits Research workshop on forecast issues and atmospheric circulation – 5 credits Issues of correlation between atmosphere and hydrosphere – 3 credits Modern issues of hydrometeorology – 3 credits Theory of general atmospheric circulation – 3 credits</p> <p><i>Elective disciplines</i> Fundamentals of negotiating process – 3 credits Oral communication in a foreign language in academic and professional activity – 3 credits Written communication in a foreign language in academic and professional activity – 3 credits Conflict management in professional activity – 3 credits Agrometeorological forecasting – 3 credits Regional weather forecasting – 3 credits Meteorological services for aviation – 3 credits Very-short-range weather forecast – 3 credits Academic and professional communication in the English language (basic level) – 4 credits Academic and professional communication in the English language (advanced level) – 4 credits</p>
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			<p><i>Internships</i></p> <p>Introductory internship – 3 credits</p> <p>Internship on mathematical modelling of atmospheric pollution – 3 credits</p> <p>Internship on theory of climate – 3 credits</p> <p>Company internship – 30 credits</p> <p>Pre-degree internship – 3 credits</p> <p>Research internship – 21 credits</p> <p>The curriculum contains 23 disciplines directly referring to the field of study</p>
13	Syllabus development	<p>Briefly describe how the syllabus is developed for the subject that is related directly to the profession, whether is planned some hours for the work of students in some workplace outside of the university. Briefly describe how the subjects are linked with the outcomes of the study program.</p>	<p>The program is elaborated by the staff of the department of meteorology and protection of the atmosphere as well as by representatives of industrial partners. In this program there are no hours devoted to students' work outside the university. This kind of work is included in internships.</p> <p>Theory of atmospheric circulation</p> <p>Professional competences concern analysis, compilation and systematisation of data and results of hydrometeorological research with the help of modern computer technologies; usage of modern methods of data processing and interpretation; development of physical and mathematical models of atmospheric circulation and development of hydrometeorological forecasts</p> <p>Modern issues of hydrometeorology</p> <p>Professional competences consider graduate's awareness of standards of organising and doing hydrometeorological activities; ability to use fundamental and</p>

			<p>applied knowledge of the studied disciplines</p> <p>Regional weather forecasting Professional competences consider graduate's ability to provide urgent hydrometeorological forecast; ability to use fundamental and applied knowledge of the studied disciplines</p>
14	Policy within the study program	Indicate the norms of students' and teachers behavior within the study program, particularly whether the students presence at the university is mandatory, which methods are used for teaching (lectures, interactive discussions, presentations, other technics), etc.	Students and teachers must be present at university, however, it is possible to arrange classes according to the needs of students who work. This program includes lectures, workshops, laboratory workshops, colloquiums
15	Students weekly workload	Specify how many hours per week students are busy at the university, how many of them are theoretical and practical classwork.	Lectures and workshops are unevenly allocated to the terms. The average workload is 10 hours per week, 34% theoretical classes and 66% workshops.